

## Abstract

A novel method was devised to synthesis an inverted titania crystal on a substrate. At first, a film of surfactant sodium dodecylsulfate (SDS) polystyrene spherical particles was grown on a substrate using Colvin method. Surfactant sodium dodecylsulfate (SDS) stabilizes polystyrene particles and induces necking between the polystyrene particles. Next, the film was dropped inside a Falcon tube that half filled with a solution comprising Titanium Isopropoxide (TiPT) or Titanium ethoxide (TEOT) diluted with anhydrous ethanol. Then, the Falcon tube was rotated in a centrifuge machine set at 1200-3600 rpm. After 30 minutes the film was removed from the tube and placed inside an anti-static plastic container. The film was stored inside the container for at least 6 hours. This was repeated many times depending on the dilution of the precursor solution (the more diluted the precursor the more the repetition) to fill up voids among the polystyrene colloidal particles. At last, the film was placed inside a tube furnace under airflow with a predetermined ramping temperature setting to remove the polystyrene template and to crystallize titania to its anatase or rutile form. At this stage titania is transformed into a crystalline form. The result of this method is a stable and well-structured inverted titania photonic crystal on a substrate.